Building Technologies Program Overview

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Integrating Social and Behavioral Insights
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The Building Technologies Program develops technologies, techniques, and tools, as well as minimum performance standards, for making residential and commercial buildings more energy efficient, productive, and affordable.

- 40 Staff Members
- FY 2009 Funding = $140 Million
- FY 2010 Funding = $200 Million
- Recovery Funds = $346 Million
BTP Mission, Vision and Goals

**Mission:** Develop technologies, techniques, and tools for making residential and commercial buildings more energy efficient, productive, and affordable.

**Vision:** Realization of marketable net-zero-energy buildings through the development of conservation technologies and practices.

**Goal:** Create technologies and design approaches that enable net-zero energy buildings at low incremental cost by 2025.

**Definition:** A net-zero energy building is a residential or commercial building with greatly reduced needs for energy through efficiency (60 to 70 percent less energy use), with the balance of energy supplied by renewable energy sources.
Buildings Sector Accounts for About 40% of US Energy, 72% of Electricity, 55% of Natural Gas, 39% of Carbon, 19% of NOx, and 52% of SO\textsubscript{2} Emissions.

Total US Consumption in 2005 was 100 Quads

Building Sector construction and renovation accounts for 9% of GDP and employs 8 million people. Energy utility bills total $370B each year.

Source: Buildings Energy Data Book, September 2007, Tables 1.1.3, 1.1.6, 3.1.1, 3.3.1, 4.1.5, 5.1.2, 5.3.1
Buildings Electricity Sales Continue to Grow While Industry Remains Flat

Source: EIA Annual Energy Review, Table 8.9
Achieving Net-Zero Whole Building Performance Drives Buildings R&D

- BTP R&D is guided by whole-building systems engineering principles and practices
- BTP R&D goals are technology neutral and cost-constrained
- BTP whole buildings Integration R&D includes analysis, design, construction, operations, maintenance and retrofit/renovation
- BTP component and equipment R&D is driven by cost and technical performance requirements needed to deliver zero-net energy buildings
- BTP R&D extends to market barriers, human dimensions, financial incentives, and public policy mechanisms
Research and Development: Integration of Technologies

- Residential Integration
- Commercial Integration
- Emerging Technology
  - Solid State Lighting
  - Space Conditioning and Refrigeration
  - Thermal Envelope
  - Windows
  - Solar heating And Cooling
  - Analysis Tools and Design Strategies

Thermal Envelope
- High R Walls and Roofs
- Smart Insulation and Vapor Barriers

Windows
- R-10 Dynamic Super Window

Space Conditioning and Refrigeration
- Integrated, low capacity heat pump.

Solar heating and Cooling
- Integrated Soar Thermal – PV Systems
- Low Cost Solar Water Heaters for Cold Climates

Domestic Hot Water
- Engineered Hot Water Distribution
- Integrated, low capacity heat pump

Lighting
- Solid State Lighting

Appliances and Other Plug Loads
- Whole House Energy Control Standard
- 10-30% Misc. Electric Savings
Technology Validation and Market Introduction

• ENERGY STAR
  – Criteria development (e.g., appliances, solid-state lighting, future products)
  – Existing homes (Home Performance with ENERGY STAR)
    • A DOE, EPA, and HUD program to target energy efficiency in existing homes
  – Retail partnerships (national campaigns, whole home services, merchandising)

• Building Codes
  – Commercial: ASHRAE 90.1-2010 30% improvement goal
  – Residential: IECC Model Code push toward 30% improvement, 2009 IECC 12–17% increase in stringency

• Targeted Markets
  – EnergySmart Schools
  – EnergySmart Hospitals

• Solar Decathlon Fall 2009

FY 2009 Budget. $1,000s

- Solar Decathlon 3,400
- Rebuild America 5,000
- Building Energy Codes 5,376
- Energy Star 7,484
Appliance Standards

- Energy efficiency standards and test procedures issued for 16 products from 1987 through 2007
  - Standards for some products raised more than once
- DOE Must Issue another 18 standards between January 2008 and June 2011
  - Covers some of the same products again
- EISA 2007 amends and extends EPACT 2005 to revisit or issue standards for another 9 products
  - Most notable is Incandescent General Service Lamps
Web Resources

DOE Building Technologies Program  
buildings.energy.gov

Building America  
buildings.energy.gov/building_america/

Commercial Building Initiative  
buildings.energy.gov/commercial_initiative/

Appliances and Commercial Equipment Standards  
buildings.energy.gov/appliance_standards/

ENERGY STAR  
buildings.energy.gov/energystar.html

Building Energy Codes  
buildings.energy.gov/energycodes.html
Energy Efficiency & Renewable Energy

BT Reports

- Building Technologies Program (BTP) Multi-Year Program Plan
  buildings.energy.gov/mypp.html

- Building Technologies Program’s 2008 Buildings Energy Data Book
  btscoredatabook.net/

- Lost Opportunities in the Buildings Sector: Energy-Efficiency Analysis and Results

- Energy Efficiency Trends in Residential and Commercial Buildings

- Implementation Report: Energy Conservation Standards Activities
  buildings.energy.gov/appliance_standards/pdfs/congressional_report_0208.pdf

- Federal R&D Agenda for Net-Zero Energy, High-Performance Green Buildings
Building America Best Practices Guides and Case Studies

URL: www1.eere.energy.gov/buildings/building_america/publications.html

• Cold & Very Cold Climates
  – Best Practices Handbook
  – Case Studies
• Hot-Dry & Mixed-Dry Climates
  – Best Practices Handbook
  – Case Studies
• Hot-Humid Climate
  – Best Practices Handbook
  – Case Studies
• Marine Climate
  – Best Practices Handbook
  – Case Studies
• Mixed-Humid Climate
  – Best Practices Handbook
  – Case Studies
• All Climates
  – Solar Thermal & Photovoltaic Systems
Advanced Energy Design Guides for 30% Energy Savings
ASHRAE, IESNA, USGBC, AIA, DOE

www.ashrae.org/aedg

More URLs: Technical Support Documents for AEDGs

30% Energy Savings
• Small Retail  
• Small Office  
• Highway Lodging  
• Small Warehouse  
• K-12 Schools  
  www.nrel.gov/docs/fy07osti/42114.pdf

50% Energy Savings
• Medium Box Retail  
  www.nrel.gov/docs/fy08osti/42828.pdf
• Grocery Stores  
  www.nrel.gov/docs/fy08osti/42829.pdf
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http://buildings.energy.gov/